

SUBSTITUTE FORM PTO-1390

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER
08641-021001

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. APPLICATION NO. (If Known, see 37 CFR 1.5)

10/009180

INTERNATIONAL APPLICATION NO.
PCT/FR00/01695

INTERNATIONAL FILING DATE
20 June 2000

PRIORITY DATE CLAIMED
22 June 1999

TITLE OF INVENTION
METHOD FOR MOLDING OPHTHALMIC LENSES

APPLICANT(S) FOR DO/EO/US
Jean-Louis Mercier

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern other documents or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.

☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

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CERTIFICATE OF MAILING BY EXPRESS MAIL

Express Mail Label No. EL24570734US

I hereby certify under 37 CFR §1.10 that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee with sufficient postage on the date indicated below and addressed to the U.S. Patent and Trademark Office, P.O. Box 2527, Arlington, VA 22202.

Date of Deposit

12-3-01

Signature

Greg Jenkins
Greg Jenkins
Printed Name of Person Signing

U.S. APPLICATION NO. (IF KNOWN)

107009180

INTERNATIONAL APPLICATION NO.
PCT/FR00/01695ATTORNEY'S DOCKET NUMBER
08641-02100117. ☒ The following fees are submitted:**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO..... **\$1040**International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO **\$890**International preliminary examination fee (37 CFR 1.482) not paid to USPTO but
international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... **\$740**International preliminary examination fee paid to USPTO (37 CFR 1.482)
but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... **\$710**International preliminary examination fee paid to USPTO (37 CFR 1.482)
and all claims satisfied provisions of PCT Article 33(1)-(4)..... **\$100****ENTER APPROPRIATE BASIC FEE AMOUNT =**

\$890.00

Surcharge of **\$130** for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$0.00

Claims	Number Filed	Number Extra	Rate	
Total Claims	37 - 20 =	17	x \$18	\$306.00
Independent Claims	3 - 3 =	0	x \$84	\$0.00
MULTIPLE DEPENDENT CLAIMS(S) (if applicable) + \$280				\$0.00

TOTAL OF ABOVE CALCULATIONS =

\$1,196.00

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are
reduced by 1/2.

\$0.00

SUBTOTAL =

\$1,196.00

Processing fee of **\$130** for furnishing the English Translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$1,196.00

TOTAL NATIONAL FEE =

\$0.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **\$40.00** per property +

\$0.00

TOTAL FEES ENCLOSED =

\$1,196.00

Amount to be

\$

Charged: \$

- a. ☒ A check in the amount of \$1,196.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. 06-1050 in the amount of \$0.00 to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-1050. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

John J. Gagel, Esq.
FISH & RICHARDSON P.C.
225 Franklin Street
Boston, Massachusetts 02110-2804
(617) 542-5070 phone
(617) 542-8906 facsimile

SIGNATURE:

Marc M. Wefers* for John J. Gagel
NAME

33,499

REGISTRATION NUMBER

*See attached document certifying that Marc M. Wefers has
limited recognition to practice before the U.S. Patent and
Trademark Office under 37 C.F.R. § 10.9(b).

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Jean-Louis Mercier
Serial No. : Unassigned
Filed : Herewith
Title : METHOD FOR MOLDING OPHTHALMIC LENSES

BOX PCT

U.S. Patent and Trademark Office
P.O. Box 2327
Arlington, VA 22202

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows:

In the claims:

Cancel claims 1-15.

Add claims 16-52.

--16. (New) A method for molding a lens of noncircular shape adapted to a wearer's prescription and to the shape of the frame chosen by the wearer, comprising the steps of :

- supplying a first mold (2) which is substantially in the shape of the lens to be obtained and trimming the first mold (2) ;
- supplying a second mold (6) and trimming the second mold (6) ;
- molding and curing a setting material (4) between the first mold and a second mold (6) ;
- removing the lens obtained from the mold.--

CERTIFICATE OF MAILING BY EXPRESS MAIL

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Date of Deposit 12-3-01

Signature Leroy Jenkins

Typed or Printed Name of Person Signing Certificate Leroy Jenkins

--17. (New) The method of claim 16, wherein the step of molding and curing comprises a step of assembling the molds, a step of molding the setting material, and a step of curing the molded material.--

--18. (New) The method of claim 16, wherein the step of curing comprises irradiating the setting material (4).--

--19. (New) The method of claim 18, wherein the step of irradiating is carried out from one side only of an assembly of the first and second molds.--

--20. (New) The method of claim 16, wherein the step of curing comprises heating of the setting material.--

--21. (New) The method of claim 16, further comprising, before the step of removing a step of applying a thermal shock to the assembly of the first and second molds.--

--22. (New) The method of claim 17, wherein the step of assembling comprises adjusting a position of the first and second molds such that they are in contact at one point on a periphery of the first mold (2).--

--23. (New) The method of claim 17, wherein the step of assembling comprises adjusting a position of the first and second molds such, or such that at one point the second mold is 1 mm or less away from a periphery of the first mold (2).--

--24. (New) The method of claim 16, wherein the step of curing comprises :

- a step of partial curing, and
- a step of total curing of the lens.--

--25. (New) The method of claim 24, wherein the step of partial curing lasts less than 3 minutes.--

--26. (New) The method of claim 24, wherein the step of total curing lasts between 5 and 30 minutes.--

--27. (New) The method of claim 16, wherein the step of molding and curing comprises :

- a step of assembling the first and second molds using at least one mold-positioning devices;
- a step of molding the setting material between the first and second molds;
- a step of partial curing of the setting material
- a step of removing said at least one mold-positioning device
- a step of total curing.--

--28. (New) The method of claim 27, wherein the step of partial curing comprises irradiating the setting material (4).--

--29. (New) The method of claim 28, wherein the step of partial curing comprises irradiating the setting material (4) from one side only of the assembly of the first and second molds.--

--30. (New) The method of claim 27, wherein the step of total curing comprises irradiating the setting material (4) from both sides of the assembly of the first and second molds.-

--31. (New) The method of claim 27, wherein the step of total curing comprises heating the setting material.--

--32. (New) A method for molding a lens of noncircular shape adapted to a wearer's prescription and to the shape of the frame chosen by the wearer, comprising the steps of :

- supplying a first mold (2) which is substantially in the shape of the lens to be obtained and trimming the first mold (2) ;

- supplying a second mold (6) which is substantially in the shape of the lens to be obtained.;

- molding and curing a setting material (4) between the first mold and a second mold (6) ;
- removing the lens obtained from the mold.--

--33. (New) The method of claim 32, wherein the step of molding and curing comprises a step of assembling the molds, a step of molding the setting material, and a step of curing the molded material.--

--34. (New) The method of claim 32, wherein the step of curing comprises irradiating the setting material (4).--

--35. (New) The method of claim 34, wherein the step of irradiating is carried out from one side only of an assembly of the first and second molds.--

--36. (New) The method of claim 32, wherein the step of curing comprises heating of the setting material.--

--37. (New) The method of claim 32, further comprising, before the step of removing a step of applying a thermal shock to the assembly of the first and second molds.--

--38. (New) The method of claim 33, wherein the step of assembling comprises adjusting a position of the first and second molds such that they are in contact at one point on a periphery of the first mold (2).--

--39. (New) The method of claim 33, wherein the step of assembling comprises adjusting a position of the first and second molds such, or such that at one point the second mold is 1 mm or less away from a periphery of the first mold (2).--

--40. (New) The method of claim 32, wherein the step of curing comprises :

- a step of partial curing, and
- a step of total curing of the lens.--

--41. (New) The method of claim 40, wherein the step of partial curing lasts less than 3 minutes.--

--42. (New) The method of claim 40, wherein the step of total curing lasts between 5 and 30 minutes.--

--43. (New) The method of claim 32, wherein the step of molding and curing comprises :

- a step of assembling the first and second molds using at least one mold-positioning devices;
- a step of molding the setting material between the first and second molds;
- a step of partial curing of the setting material
- a step of removing said at least one mold-positioning device
- a step of total curing.--

--44. (New) The method of claim 43, wherein the step of partial curing comprises irradiating the setting material (4).--

--45. (New) The method of claim 43, wherein the step of partial curing comprises irradiating the setting material (4) from one side only of the assembly of the first and second molds.--

--46. (New) The method of claim 43, wherein the step of total curing comprises irradiating the setting material (4) from both sides of the assembly of the first and second molds.-

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--47. (New) The method of claim 43, wherein the step of total curing comprises heating the setting material.--

--48. (New) The method of claim 16, wherein the lens is an ophthalmic lens.--

--49. (New) The method of claim 32, wherein the lens is an ophthalmic lens.--

--50. (New) An untrimmed molded lens of noncircular shape.--

--51. (New) A lens obtained according to the method of claim 16.--

--52. (New) A lens obtained according to the method of claim 32.--

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REMARKS

All amendments have been made to remove multiple dependency while conserving the claimed subject matter. No new matter has been introduced.

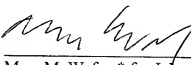
Attached is a marked-up version of the changes being made by the current amendment.

Claims 16-52 are now pending. Applicant submits that all of the claims are now in condition for examination, which action is requested. Please apply any charges or credits to Deposit Account No. 06-1050 referencing attorney docket no. 08641-021001.

Respectfully submitted,

Date: _____

12/3/01



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*See attached document certifying that Marc M. Wefers has limited recognition to practice before the U.S. Patent and Trademark Office under 37 C.F.R. § 10.9(b).

Version with markings to show changes made

In the claims:

Claims 1-15 have been cancelled.

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5 METHOD FOR MOLDING OPHTHALMIC LENSES

10 The invention relates to molded lenses, and more specifically to a method for molding ophthalmic lenses.

Ophthalmic lenses made of organic glass - polymerized material - are used for optical correction; they are mounted for this purpose in frames. One of the problems which arises for such lenses is that of their manufacture.

15 CA-A-0 596 660 discloses a method and an apparatus for molding lenses made of setting resin. Said document proposes to mold the lenses between two tempered glass molds with parallel faces; the molds are circular, and are separated at their periphery by a flexible or rigid ring seal whose thickness corresponds to the final thickness of the lens. The assembly allows the lenses to be molded without the resin coming into contact with the air when it is heated. Said document
20 mentions the problems of shrinkage of the resin when it is heated, and of isolation of the ambient air for the polymerization. FR-A-1 128 971 proposes the use of quartz molds for the molding.

FR-A-1 166 582 discloses a method and apparatus for molding lenses; the apparatus has a lower punch, made of glass and/or metal, and an upper punch; said
25 document suggests that the lower punch should extend beyond the edge of the upper punch, so as to make a reserve for an excess of monomer to be polymerized. As the document proposes heating the monomer starting from the center of the punch, the presence of excess resin makes it possible to compensate for the shrinkage in the region of the molding surfaces of the punches. Said document also
30 mentions that the rim of the lens is rough due to the provision of the reserve, and must then be polished.

US-A-5 288 221 proposes a solution to another problem. The subject of said document is that of solving the problems arising in the manufacture of ophthalmic lenses by bonding two wafers to each other. This bonding is an operation which is
35 difficult to perform especially on account of the impurities and bubbles in the adhesive; in addition, it is necessary in such a solution to have available a large number of wafers. Said document thus proposes to mold a lens to one of the wafers: during the polymerization, the polymerizable material assembles with the wafer to make the lens. To carry out the molding, said US document proposes to

use a ring seal, arranged around the wafer. A support positions the mold at a known distance from the wafer, so as to be able to cure the polymerizable material. It is also suggested in said document that the mold should be slightly smaller than the wafer: this makes it possible to fill the cavity to excess to avoid bubbles, and that the excess material should escape between the periphery of the mold and the ring seal. EP-A-0 371 621 describes another method for manufacturing lenses by bonding two wafers. Said document proposes to mold a support onto the front of one wafer, to enable the subsequent manipulation and machining of the wafer. The support is detached from the wafer after it has been machined and bonded to the second wafer.

WO-A-89/11966 raises the problem of machining the surfaces of ophthalmic lenses. Said document proposes to provide plastic half-molds, avoiding any subsequent machining of the surface of the lenses; the half-molds are used to mold lenses; it is merely necessary to machine these lenses to the shape of the frame, without machining the surface. The problem raised in said document is that of surface machining, but trimming is not at all mentioned, or even suggested.

The prior art thus describes the problems associated with molding a viscous polymerizable material, which shrinks during the polymerization.

US-A-3 881 683 discloses a method for molding ophthalmic lenses. Said document attempts to solve the problem of the thickness of the edges of lenses of negative power. It proposes a ring seal with seats designed to receive half-molds; the presence of these seats reduces the risks of breakage of half-molds made of glass. Said document also proposes to adapt the shape of the seal to reduce the thickness of the edge of the lenses. In all cases, a step of machining the lens to adapt it to the shape of the frame is necessary; the document indicates that the method is carried out without losses on the final diameter of the lens. A circular lens is thus obtained, which still needs to be adapted to the shape of the frame. Said document is directed exclusively toward the problem of lenses of negative power, and makes no mention either of other lenses or of the problem of the shape of the lenses.

The invention addresses the new problem of the product obtained during molding. It is based on the observation that the ophthalmic lenses supplied to opticians require various operations in order to be adapted to the shape of the frame chosen by the wearer - whether this is a standard encircling frame or a more modern frame which does not go all the way around the lens. The lens intended to be mounted in the frame may be obtained either by machining and trimming a semi-finished glass, or by trimming a finished glass. In the first case, the operation

for surfacing the rear face is expensive; in the second case, the lens obtained is not optimized in terms of thickness.

In addition, the polymerizable material is expensive: a large amount of the material used during the molding is wasted, insofar as it is then discarded during the trimming, and possibly the surfacing.

Finally, the standard methodes pose a problem, more particularly for the manufacture of convex lenses, for which the thickness of the lens is larger at the center of the lens than at its periphery. Finished lenses are manufactured in the prior-art methodes by fixing the thickness of the lens at its periphery, for example at a value of 1 mm as proposed in US-A-5 288 221. After trimming, especially for lenses with a strong correction, the thickness of the lens at its periphery is large. The lenses obtained have the drawback of being thicker than necessary, and thus heavier and more unattractive.

The invention makes it possible to improve the appearance of a molded lens adapted to the shape of the frame, especially for strong corrections; it provides a lens which, for an equal power, is thinner than lenses adapted to the shape of the frame by trimming finished glasses. It ensures that the lens is of lower weight, and thus improves the comfort for wearers. The invention proposes a method which is less expensive than the one conventionally used for manufacturing such lenses from semifinished products. It saves on polymerizable material and makes the manufacture by molding easier. It makes it possible to dispense with the machining step, and to obtain a lens whose thickness is optimized relative to the shape of the frame, and relative to the wearer's prescription.

To solve these new problems and to obtain these advantages, the invention proposes a method for molding a lens adapted to a wearer's prescription and to the shape of the frame chosen by the wearer, comprising the steps of :

- supplying a first mold which is substantially in the shape of the lens to be obtained, or of the frame to be obtained;
- supplying a second mold ;
- molding and curing a setting material between the first mold and a second mold ;
- removing the lens obtained from the mold.

In one embodiment, the step of supplying a first mold comprises a step of trimming said mold.

In another embodiment, the curing step is a step of partial curing, and the method also comprises a step of total curing of the lens.

In another embodiment, the step of molding and curing comprises a step of assembling the molds followed by a curing step.

Advantageously, the partial curing step lasts less than 3 minutes.
 Preferably, the total curing step lasts between 5 and 30 minutes.

5 In yet another embodiment, the method involves a step of removing mold-positioning devices after the partial curing step and before the total curing step.

Advantageously, the partial curing step comprises an irradiation of the setting material, preferably by irradiation from only one side of the assembly of the first and second molds.

10 In one embodiment, the total curing step comprises irradiation of the setting material, preferably by irradiation from both sides of the assembly of the first and second molds.

Preferably, the total curing step comprises the heating of the setting material.

Advantageously, the demolding step comprises the application of a thermal
 15 shock to the assembly of the first and second molds.

In one embodiment, the method involves a step of supplying a second mold in the shape of the lens to be obtained.

In this case, the step of supplying a second mold may comprise a step of trimming said mold.

20 Preferably, the lens is an ophthalmic lens.

The invention also proposes a lens obtained according to such a method.

The invention further proposes an untrimmed molded lens of noncircular shape.

Other characteristics and advantages of the invention will emerge on reading
 25 the description which follows of the embodiments of the invention, which is given by way of example and with reference to the attached drawings, which show:

- figure 1 a representation in perspective of an assembly according to the invention;
- figure 2, representation in cutaway of the assembly of figure 1;
- 30 - figure 3 a representation in top view of an assembly according to the invention;
- figure 4, a graph of the thickness at the edge of a lens according to the invention.

The invention proposes, as in the prior art, to mold a lens made of
 35 polymerizable material between two molds; it also proposes to trim, before molding, at least one of the two molds, to give it a shape close to that of the shape of the trimmed lens.

The invention makes it possible in this way to limit the amount of polymerizable material used, and to optimize the thickness of the final lens as a

function of the shape of the frame and the wearer's prescription. A saving in polymerizable material of the order of 60% relative to the standard method using a semifinished lens may be achieved.

One preferred embodiment of the invention, in which only the upper mold is trimmed, is described with reference to the figures. Figure 2 shows a representation in cutaway of an assembly according to the invention; this assembly comprises a first mold 2, which is the upper mold in the example, and a second mold 6 which is the lower mold. Between these molds is cast a setting material 4, for example a setting composition such as those described in patent US-A-5 702 825 of the Applicant. More generally, setting materials known per se, and for example thermosetting materials, or even thermoplastics, may be used to carry out the invention; in the latter case, the device is preferably adapted; the technique of compression injection-molding may be used in this case. The convex mold, generally made of metal, trimmed to the shape of the frame, may be reused.

As shown in the figure, and as emerges more clearly from figure 1, the second mold 6 is a circular mold, of the type commonly used nowadays for molding lenses; it may especially be a glass, metal, ceramic or plastic mold, such as those described in the prior-art documents mentioned above. It has a diameter in the region of 80 mm, close to the diameter of the known lenses of the prior art.

On the other hand, the first mold 2 of figure 1 has a contour which is substantially that of the lens to be obtained. "Substantially" the shape of the lens means a shape which allows the optional subsequent trimming of the lens to make it possible, for example, to remove small peripheral molding defects, or alternatively a trimming of the perimeter of the lens to allow it to be mounted in a specific frame. A value of a few millimeters around the inner shape required by the frame is adapted. In all cases, it is only a finishing trimming, on a few millimeters or less; it does not involve a substantial removal of material, like that which is necessary to go from a circular lens with a diameter of between 60 and 80 mm to a lens having the shape of the frame - which may have Boxings sides A and B of 30 to 40 mm. The removal of material is thus at least 1 cm.

The contour may be of any nature, and in fact depends on the nature of the frame chosen by the final user of the lens. The maximum size of the mold between two points on its perimeter is less than the diameter of the second mold. The first mold is advantageously obtained by trimming before molding the setting material, for example, by trimming using a standard grinding wheel for a circular mold; a grinding wheel of the type described in patent US-A-4 596 091 of the Applicant may advantageously be used.

Any material may be used for the first mold; insofar as the mold is to be used only once, or otherwise only a very limited number of times, it is advantageous that its price should also be limited; one simple solution consists in using a thermoplastic or thermosetting mold such as, for example, a mold made of polycarbonate or poly(allyldiethylene glycol carbonate).

The first and second molds are assembled using apparatus which is known per se for the molding and curing of setting material; from this point of view, the teaching of the prior art may be applied, and, for example, devices for holding in position molds of the type described in the prior-art patents mentioned above may be used. A ring seal may be included around the first mold, if necessary, and especially in the case of concave lenses. If the second mold is not trimmed, it may be used as a reserve of material for the molding.

Contrary to the prior art, the invention makes it possible to obtain a zero or very low thickness on the perimeter of the lens. It is possible, for example, to adjust the position of the molds such that they are in contact at one point on the periphery of the first mold, or such that they are 1 mm or less away from the periphery of the first mold. It is clear that the position of the molds, as in the prior art, depends on the prescription.

The molding may be performed as follows:

- introduction of the second mold ;
- where appropriate, insertion of a ring seal ;
- introduction of the setting material into the second mold; the amount of material may be calculated beforehand ;
- introduction of the first mold; this sequence makes it possible to successfully remove the bubbles, better than an injection of the material between the molds; however, an injection remains possible.

The method for curing the material is performed in a manner which is known per se. The method may also be performed in several steps, for example:

- irradiation, for example with ultraviolet rays, to set the setting material; this step may be termed as partial curing ;
- dismounting from the mold-holding apparatus ;
- total curing, for example by heating in an oven; a precise temperature control may be ensured, and the shrinkage may thus be limited, ensuring good curing. The total curing may also be performed by ultraviolet irradiation.

In a typical case, the partial curing may follow the assembly of the molds; it normally lasts less than 3 minutes, which is sufficient to ensure that the assembly

formed from the molds does not move. On the other hand, the total curing step may last between 5 and 30 minutes.

It is then possible to ensure removal of the lens from the mold, this lens having the power and shape required for the wearer and his frame, for example by
5 subjecting the assembly containing the lens of the invention to a thermal shock.

Figure 1 shows a representation in perspective of an assembly according to the invention; as for figure 1, the mold-holding apparatus has not been shown. It is clearly seen in the figure that the first mold has a shape that is substantially
10 identical to the shape of a frame, whereas the second mold is larger in size and is designed to serve as a reservoir of material.

Figure 3 shows a representation in top view of an assembly according to the invention; this is the case of a lens with a power of +6.00 diopters, made of a setting material with an index of 1.5, without off-centering. By disregarding the
15 effect of the thickness of the center of the lens - which is a second-order term in the correction, a first mold having the shape in the figure, with a radius of curvature of 250 mm, is obtained for a second mold with a base of 8 diopters and a radius of 62.5 mm. The maximum size of the first mold is 53.2 mm for the shape of frame chosen.

Figure 4 shows a graph of the thickness of a lens manufactured using the mold of figure 3. The thickness in millimeters is given on the y-axis and the angle is given on the x-axis. The thickness ranges between 0 and 2.4 mm. For
20 comparative purposes, in a standard trimmed lens, the thickness for this prescription and this shape of frame ranges between 3.5 and 5.9 mm.

For the convex mold, which is the trimmed mold in the example of the figures, the base may be varied in steps of 0.12 diopters. For the cylinder, a step of 0.25 diopters would be acceptable. For a power range of 1 diopter and a cylinder range of 1 to 3 diopters, 8×12 , i.e. 96 different molds may thus be provided. For
25 the concave mold, there is no change relative to the standard manufacturing method, and the number of molds required to cover the range, in addition and in power, is used.

Needless to say, the present invention is not limited to the examples and embodiments described and shown, but is susceptible to numerous variants accessible to those skilled in the art. A wafer which must form part of the lens may
35 be used for one of the molds, as proposed in US-A-5 288 221: in this case, the method of the invention also makes it possible to limit the amount of material.

The two molds may also be trimmed before molding.

The invention applies not only to standard prescriptions - spherical or with a torus - but also to the manufacture of gradual or nongradual varifocal lenses. In this case, the second mold is a varifocal aspherical mold.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	

CLAIMS AS PUBLISHED

1. A method for molding a lens adapted to a wearer's prescription and
5 to the shape of the frame chosen by the wearer, comprising the steps of:
- supplying a first mold (2) which is substantially in the shape of the lens to be obtained ;
 - supplying a second mold (6) ;
 - molding and curing a setting material (4) between the first mold and a
10 second mold (6) ;
 - removing the lens obtained from the mold.
2. The method as claimed in claim 1, characterized in that the step of
supplying a first mold comprises a step of trimming said mold.
- 15 3. The method as claimed in claim 1 or 2, characterized in that the
curing step is a step of partial curing, and in that it also comprises a step of total
curing of the lens.
- 20 4. The method as claimed in claim 1, 2 or 3, characterized in that the
step of molding and curing comprises a step of assembling the molds followed by
a curing step.
5. The method as claimed in claim 3 or 4, characterized in that the
25 partial curing step lasts less than 3 minutes.
6. The method as claimed in claim 3, 4 or 5, characterized in that the
total curing step lasts between 5 and 30 minutes.
- 30 7. The method as claimed in claim 6, characterized in that it involves a
step of removing mold-positioning devices after the partial curing step and before
the total curing step.
8. The method as claimed in claim 6 or 7, characterized in that the
35 partial curing step comprises an irradiation of the setting material (4) preferably by
irradiation from only one side of the assembly of the first and second molds.

9. The method as claimed in claim 6, 7 or 8, characterized in that the total curing step comprises an irradiation of the setting material (4), preferably by irradiation from both sides of the assembly of the first and second molds.

5

10. The method as claimed in one of claims 6, 7 or 8, characterized in that the total curing step comprises the heating of the setting material.

11. The method as claimed in one of claims 1 to 10, characterized in that the demolding step comprises the application of a thermal shock to the assembly of the first and second molds.

12. The method as claimed in one of claims 1 to 11, characterized in that it involves a step of supplying a second mold (6) in the shape of the lens to be obtained.

15

13. The method as claimed in claim 12, characterized in that the step of supplying a second mold comprises a step of trimming said mold.

14. The method of one of claims 1 to 13, characterized in that the lens is an ophthalmic lens.

20

15. A lens obtained according to the method of one of claims 1 to 14.

16. An untrimmed molded lens of noncircular shape.

25

CLAIMS MODIFIED AFTER IPER REPORT

1. A method for molding a lens of noncircular shape adapted to a
5 wearer's prescription and to the shape of the frame chosen by the wearer, comprising
the steps of :
- supplying a first mold (2) which is substantially in the shape of the lens to
be obtained and trimming the first mold (2) ;
 - supplying a second mold (6) and trimming the second mold (6) ;
 - 10 - molding and curing a setting material (4) between the first mold and a
second mold (6) ;
 - removing the lens obtained from the mold.
2. The method as claimed in claim 1, characterized in that the curing step
15 is a step of partial curing, and in that it also comprises a step of total curing of the
lens.
3. The method as claimed in claim 1 or 2, characterized in that the step
of molding and curing comprises a step of assembling the molds followed by a
20 curing step.
4. The method as claimed in claim 2 or 3, characterized in that the partial
curing step lasts less than 3 minutes.
5. The method as claimed in claim 2, 3 or 4, characterized in that the
25 total curing step lasts between 5 and 30 minutes.
6. The method as claimed in claim 5, characterized in that it involves a
step of removing mold-positioning devices after the partial curing step and before the
30 total curing step.
7. The method as claimed in claim 5 or 6, characterized in that the partial
curing step comprises an irradiation of the setting material (4) preferably by
irradiation from only one side of the assembly of the first and second molds.

8. The method as claimed in claim 5, 6 or 7, characterized in that the total curing step comprises an irradiation of the setting material (4), preferably by irradiation from both sides of the assembly of the first and second molds.

5 9. The method as claimed in one of claims 5, 6 and 7, characterized in that the total curing step comprises the heating of the setting material.

10 10. The method as claimed in one of claims 1 to 9, characterized in that the demolding step comprises the application of a thermal shock to the assembly of the first and second molds.

11. The method as claimed in one of claims 1 to 10, characterized in that it involves a step of supplying a second mold (6) in the shape of the lens to be obtained.

15

12. The method as claimed in one of claims 1 to 11, characterized in that the lens is an ophthalmic lens.

13. The method as claimed in one of claims 1 to 12, characterized in that the step of molding and curing comprises a step of assembling molds followed by a curing step, the mold-assembling step comprises the adjustment of the position of the molds such that they are in contact at one point on the periphery of the first mold (2), or such that they are 1 mm or less away from the periphery of the first mold (2).

25 14. A lens obtained according to the method of one of claims 1 to 13.

15. An untrimmed molded lens of noncircular shape.

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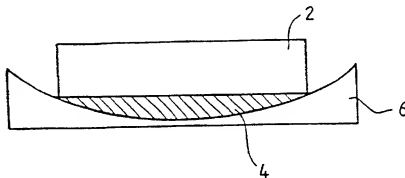
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(54) Title: METHOD FOR MOULDING OPHTHALMIC LENSES

(54) Titre: PROCÉDE DE MOULAGE DE LENTILLES OPHTHALMIQUES

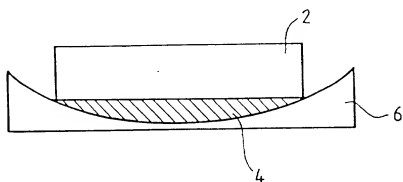
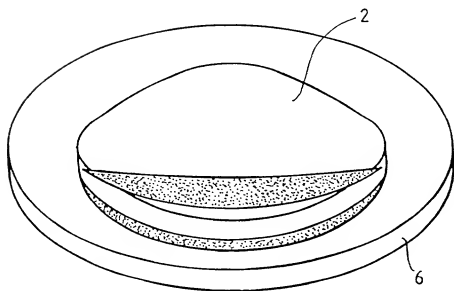


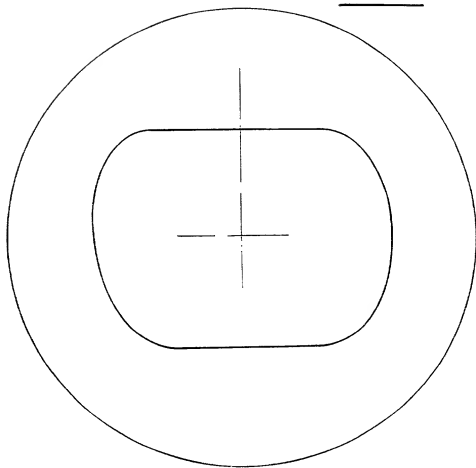
(57) Abstract: The invention concerns a method for moulding a lens, between a first mould (2) and a second mould (6) which consists in: machining at least one of the moulds (2) into the shape of the lens to be obtained, before moulding. The invention enables to obtain finer lenses, while limiting the required amount of hardenable material for making the lens.

(57) Abrégé: L'invention concerne un procédé de moulage d'une lentille, entre un premier (2) et un second moule (6); elle propose d'usiner au moins l'un des moules (2) à la forme de la lentille à obtenir, avant le moulage. L'invention permet d'obtenir des lentilles plus fines, tout en limitant la quantité de matériau durcissable nécessaire pour la fabrication de la lentille.

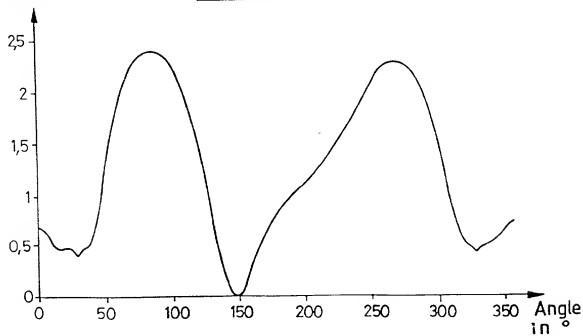
WO 00/78531 A1

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FIG_1FIG_2

$\frac{2}{2}$ FIG_3FIG_4

Epb in mm



COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled METHOD FOR MOLDING OPHTHALMIC LENSES, the specification of which:

- ☐ is attached hereto.
☒ was filed on December 3, 2001 as Application Serial No. 10/009,180 and was amended on _____
☐ was described and claimed in PCT International Application No. _____ filed on _____ and as amended under PCT Article 19 on _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information I know to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

Country	Application No.	Filing Date	Priority Claimed	
France	99 07 936	June 22, 1999	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
PCT	PCT/FR00/01695	June 20, 2000	<input type="checkbox"/> Yes	<input type="checkbox"/> No

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Combined Declaration and Power of Attorney

Page 2 of 2 Pages

1-00
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